Progress Energy

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SEP 0 1 2005

U.S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555

Serial: HNP-05-101
10 CFR 50.54(f)

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400/LICENSE NO. NPF-63
RESPONSE TO NRC GENERIC LETTER 2004-02, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE NO EMERGENCY RECIRCULATION DURING DESIGN BASIS ACCIDENTS AT PRESSURIZED-WATER REACTORS"

Ladies and Gentlemen:

In accordance with the Code of Federal Regulations, Title 10, Part 50.54(f), Carolina Power and Light Company (CP&L) doing business as Progress Energy Carolinas, Inc., is providing additional information for the Harris Nuclear Plant (HNP) as requested by NRC Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," which was issued on September 13, 2004.

In GL 2004-02, the NRC requested licensees to submit information within ninety (90) days of issuance of the safety evaluation, "Pressurized Water Reactor Containment Sump Evaluation Methodology," which was issued on December 6, 2004, and to submit additional information no later than September 1, 2005. The 90-day response was submitted by letter number PE&RAS-05-008 dated March 4, 2005.

Attachment 1 provides a summary of the HNP response.

Attachment 2 provides the requested September 1, 2005 response for HNP.

Attachment 3 provides one Regulatory Commitment to complete the corrective actions of this response letter by December 31, 2007.

Please refer any question regarding this submittal to Mr. Dave Corlett at (919) 362-3137.

I declare, under penalty of perjury, that the attached information is true and correct (Executed on SEP 0 1 2005).

Sincerely,

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Attachments:

1. General Overview Summary
2. Response to NRC Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors"
3. Regulatory Commitments

c:
Mr. R. A. Musser, NRC Senior Resident Inspector
Mr. C. P. Patel, NRC Project Manager
Dr. W. D. Travers, NRC Regional Administrator

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GENERAL OVERVIEW SUMMARY

General Overview Summary

Harris Nuclear Plant (HNP) has two independent sumps, each with a screen area of 398 square feet, which is robust compared to others in the industry. The design of the sumps is not highly susceptible to clogging. However, to resolve NRC Generic Safety Issue (GSI) 191 and NRC Generic Letter (GL) 2004-02, design changes are planned for HNP, with most hardware modifications being implemented in Refueling Outage 14 (RFO-14), which is scheduled to begin in September 2007.

As an overview, the design strategy for HNP resolution of GSI-191 includes the following basic features:

1) Ensure sufficient water supply reaches the containment sump during long-term recirculation. This is an upstream effect improvement accomplished by:
   - Ensuring credited flow paths to the sump remain clear (fuel transfer canal drain trash rack).
2) Minimize head loss due to debris accumulation at the sump screens and improving pump Net Positive Suction Head margin by:
   - Increasing surface area utilizing a complex strainer geometry. Surface area is to be increased by approximately a factor of five (from 398 square feet per sump to approximately 2,000 square feet per sump).
   - Providing adequate debris mass capture (interstitial volume) without impacting effective strainer surface area (complex geometry helps induce non-uniform loading).
   - Removing some or all of the Min-K insulation on the loops seals of the pressurizer safety relief valves and power-operated relief valves.
3) Minimize latent debris by:
   - Maintaining containment close-out cleanliness/FME standards.
   - Maintaining an effective coatings program.
4) Procedural enhancements of plant programs.

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Request: 2(a)
Confirmation that the ECCS and CSS recirculation functions under debris loading conditions are or will be in compliance with the regulatory requirements listed in the Applicable Regulatory Requirements section of this generic letter [(i.e., 10CFR50.46 and if applicable, GDCs 38 (containment heat removal) and GDC 41 (containment atmosphere cleanup))].

This submittal should address the configuration of the plant that will exist once all modifications required for regulatory compliance have been made and this licensing basis has been updated to reflect the results of the analysis described above.

Response: 2(a)
HNP plans to be in full compliance with the ECCS and CSS recirculation function requirements of 10CFR50.46, and also with GDC 38 and GDC 41 to the extent specified in the FSAR. In addition, the CSS will be fully capable of reducing the accident source term to meet the limits of 10 CFR 50.67.

These conditions will be satisfied following implementation of the modifications described in 2(b) below and following any necessary revisions to the licensing basis to reflect results of the GSI-191 analyses described in 2(e) below.

Request: 2(b)
A general description of and implementation schedule for all corrective actions, including any plant modifications, that you identified while responding to this generic letter. Efforts to implement the identified actions should be initiated no later than the first refueling outage starting after April 1, 2006. All actions should be completed by December 31, 2007. Provide justification for not implementing the identified actions during the first refueling outage starting after April 1, 2006. If all corrective actions will not be completed by December 31, 2007, describe how the regulatory requirements discussed in the Applicable Regulatory Requirements section will be met until the corrective actions are completed.

Response: 2(b)
HNP has performed analyses in general accordance with the methodology presented in NEI Guidance Report 04-07, "Pressurized Water Reactor Sump Performance Evaluation Methodology", Volume 1 - "Pressurized Water Reactor Sump Performance Evaluation Methodology", Revision 0, December 2004, and Volume 2 - "Safety Evaluation by the Office of NRR related to NRC Generic Letter 2004-02, Revision 0, December 6, 2004" (referred to as the "NRC methodology" in the balance of this letter). The analyses are further discussed in Response 2(c) and were used to generate a conceptual design that will accommodate the most limiting post-LOCA debris generation, transport, and head loss

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Response: 2(b) (continued)

conditions adverse to recirculation sump performance with margin available to address chemical-effects phenomena currently under study. The values provided below for head loss and available Net Positive Suction Head (NPSH) margin associated with the conceptual design are limiting values; the final design is expected to yield less head loss under debris-laden conditions.

HNP has two sump structures; each sump structure has six screens of 66.25 square feet of area, for a total of 398 square feet of screen area per sump structure. The screens have 1/8 of an inch diameter perforations. Each sump structure is surrounded by a curb that is 18 inches high. The existing sump screens will be replaced with new sump screens of complex geometry with an effective surface area of approximately 2,000 ft^2 per sump structure. The conceptual design of the new sump screens includes as one option, installation of vertical "tophat" strainers (rolled perforated plate) in the existing sump pits, similar to the Crystal River 3 (CR3) design. The existing sump trash racks would be retained. Other types of complex design strainers are also being considered. Based on downstream-effects evaluations completed to date, the minimum opening in any piping system component downstream of the screens is 0.209" based on the size of the High Head Safety Injection (HHSI) throttled valve opening, indicating that 1/8 of an inch (0.125") diameter openings in the new screens would be acceptable. The actual opening size of the replacement screens will be determined following completion of the downstream effects evaluations. The larger screens are needed to accommodate the maximum postulated quantity and types of accident-generated and latent debris that could reach the sump screen. The larger screens ensure that positive NPSH margin is maintained. Plant-specific debris bed testing is planned, as part of the final design, to validate the head loss assumptions for the microporous type insulations installed in the HNP containment (i.e., Min-K and Microtherm). Based on the relatively thin debris-bed thickness and the low screen approach velocity, testing is expected to demonstrate that existing head loss assumptions are conservative.

Min-K insulation is installed on the pressurizer SRV and PORV loop seals. HNP plans to replace part or all of this Min-K insulation with insulation that results in less head loss. The goal of this replacement effort is to lower head loss associated with a pressurizer spray line break such that it is no longer the most limiting break. The amount of insulation replaced will be determined based on this goal. The conceptual design discussed in this GL response is based on eliminating 50% of the existing Min-K insulation.

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Response: 2(b) (continued)

HNP plans to install a trash rack over the drain in the refueling canal to ensure that the assumptions in the head loss calculation remain valid. This calculation assumes that only 12 cubic feet of water are retained in the refueling canal. Installation of the trash rack over the refueling canal drain will ensure that no more than this amount of inventory is retained.

HNP is currently evaluating components downstream of the recirculation sump screens for blockage and wear. No corrective actions have been identified based on the evaluations completed to date. However, corrective actions may be identified during the course of completing this evaluation.

Corrective actions that involve programmatic controls are described in response 2(f).

Implementation schedule for Corrective Actions:

1. Installation of the new sump screens and refueling-canal trash rack and replacement of some or all of the Min-K insulation will be performed during RFO-14 (scheduled to begin September 22, 2007).

2. Evaluation of effects of operation with debris laden fluid on downstream components is currently underway. Corrective actions to address any concerns identified by this evaluation will be identified by December 31, 2005 (excluding fuel/vessel internals evaluation). Corrective actions to address any concerns identified by the evaluation of the fuel and vessel internals will be completed by March 31, 2006. Any required design change packages will be developed by November 6, 2007. Design changes requiring an outage to implement will be completed during RFO-14 (scheduled to begin September 22, 2007), and all downstream component design changes will be complete by December 31, 2007.

3. The schedule for implementing programmatic controls described in response 2(f) is December 31, 2007.

4. Head loss testing of the HNP microporous insulating materials to validate current assumptions is scheduled to be completed by March, 31, 2006.

HNP RFO-13 is scheduled to start April 8, 2006, which is only seven days later than the GL requested corrective action implementation initiation date of April 1, 2006. The following justification is offered for implementing corrective actions during RFO-14 as opposed to during RFO-13: 1) the scheduled start for RFO-13 is only sightly beyond (i.e.,

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Response: 2(b) (continued)

seven days) the GL requested implementation date, 2) some industry issues (i.e., chemical effects and coating ZOI radius) are not yet fully resolved which precludes development of a final design in time to support implementation of corrective actions in RFO-13, 3) HNP plans to perform supplemental walkdowns in containment during RFO13 to validate assumptions used in the evaluation methodology regarding latent debris, 4) the design of the existing sump screens (i.e., two separate sumps each with a screen area of 398 ft^2) is robust compared to others in the industry, 5) the NRC concluded in GL 2004-02 that continued operation pending completion of corrective actions was justified through the end of the GSI-191 resolution period (i.e., December 31, 2007), and 6) despite the start date, the corrective actions are scheduled to be completed by December 31, 2007 as requested by the GL and as stipulated in the NRC continued operation justification.

Request: 2(c)
A description of the methodology that was used to perform the analysis of the susceptibility of the ECCS and CSS recirculation functions to the adverse effects of post-accident debris blockage and operation with debris-laden fluids. The submittal may reference a guidance document (e.g., Regulatory Guide 1.82, Rev. 3, industry guidance) or other methodology previously submitted to the NRC. (The submittal may also reference the response to Item 1 of the Requested Information described above. The documents to be submitted or referenced should include the results of any supporting containment walkdown surveillance performed to identify potential debris sources and other pertinent containment characteristics.)

Response: 2(c)
Susceptibility of the ECCS and CSS recirculation functions to adverse effects of post-accident debris blockage and operation with debris-laden fluids are being analyzed by methods intended to conform to the NRC methodology. Analyses for determining the impact on ECCS and CSS operation with debris-laden fluid are being supplemented using guidance from WCAP-16406, Evaluation of Downstream Sump Debris Effects in Support of GSI-191, Revision 0.

Debris generation, debris transport, and screen head loss analyses in support of the conceptual screen design were developed for HNP by the Enercon/Alion/Westinghouse consortium.

The sump pool debris transport portion of the baseline NRC methodology was refined by computational fluid dynamics (CFD) modeling. The NRC methodology conditions and limitations applicable to use of refined transport methodologies are incorporated into the analyses.

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Response: 2(c) (continued)

Exceptions to the NRC methodology were identified in letter PE&RAS-05-008, "Response To NRC Generic Letter 2004-02 'Potential Impact Of Debris Blockage On Emergency Recirculation During Design Basis Accidents At Pressurized-Water Reactors," dated March 4, 2005. The following list includes additional exceptions, as well as updates to the previously identified exceptions:

1. The Zone of Influence (ZOI) for qualified epoxy coatings has been established as a sphere with a radius of five times the pipe break diameter. This radius is less than the radius of ten pipe break diameters recommended in Volume 2, section 3.4.2.1 of the NRC methodology. However, it is expected that the smaller diameter ZOI will be supported by planned industry testing, with resolution expected by June 30, 2006. HNP's 90-day response to GL 2004-02 stated the ZOI would have a radius of four times the pipe break diameter. The increase in ZOI is to further ensure the ZOI will be supported by test data.

2. Unqualified epoxy coatings outside the ZOI will be assumed to fail as chips, with a characteristic size dependent on coating thickness. Section 3.4.3.6 of the NRC methodology recommends that unqualified epoxy coatings outside the ZOI fail as particulate with a diameter of 10 microns. However, the 10 micron size is associated with erosion of coatings due to high pressure jet impingement inside the ZOI. Coatings outside the ZOI will not be exposed to jet impingement and therefore the predominant failure mechanism will not be erosion. Additionally, the majority of the unqualified epoxy coatings are considered unqualified because of incomplete documentation or inaccessibility for the required preparation, application, or inspection. Such coatings were Design Basis Accident (DBA) qualified and were applied using manufacturers' recommendations and industry standards as guidelines. Furthermore, per section 3.4.2.1 of Volume 2 of the NRC methodology, degraded "qualified" coatings that have not been remediated should be treated as unqualified coatings. The CR3 pilot plant audit report did not take issue with the concept of degraded qualified (i.e., unqualified) epoxy coatings outside the ZOI failing as chips instead of particulates. Section 3.7.2 of the CR3 pilot plant audit report states that "(t)he NRC staff agrees that degraded qualified coatings outside the ZOI failing as chips as a reasonable assumption."

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Response: 2(c) (continued)

Containment walkdown surveillances to identify potential accident debris sources were performed in general agreement with the guidance provided in NEI 02-01, "Condition Assessment Guidelines: Debris Sources Inside PWR Containments", Revision 1, September 2002. These walkdowns noted the types of insulation on the various systems in containment and that the insulation was generally in good condition. HNP plans to perform supplemental walkdowns in containment during RFO13 (scheduled to start on April 8, 2006) to validate assumptions used in the GSI-191 analyses regarding latent debris.

Request: 2(d)(i)
The minimum available NPSH margin for the ECCS and CSS pumps with an unblocked sump screen.

Response: 2(d)(i)
The minimum available Net Positive Suction Head (NPSH) margins for the ECCS and CSS pumps based on current design calculations are reported below. HHSI (i.e., CSIP) pumps are in series with the RHR pumps when on recirculation.

Pump	Flowrate (gpm)	NPSH Available (ft)	NPSH Required (ft)	NPSH margin (ft)
RHR	4,500	22.2	19	3.2
CS	2,110	27.23	12	15.23
CSIP	685	90	28	62

These values of NPSH available are based on a sump pool depth of 2.96 ft. Using a pool depth of 2.9 ft and a value of clean screen head loss (0.1 ft) from the conceptual screen design, the values of NPSH margin are then:

RHR pump - 3.0 ft H_2O
CS pump - 15 ft H_2O
CSIP - 61.8 ft H_2O

Request: 2(d)(ii)
The submerged area of the sump screen at this time and the percent of submergence of the sump screen (i.e., partial or full) at the time of the switchover to sump recirculation.

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Response: 2(d)(ii)
Submerged screen area and extent of submergence, at the time of switchover to sump recirculation, are approximately 2,000 square feet and full submergence, respectively. The reported information is based on conceptual screen designs.

Request: 2(d)(iii)
The maximum head loss postulated from debris accumulation on the submerged sump screen, and a description of the primary constituents of the debris bed that result in this head loss. In addition to debris generated by jet forces from the pipe rupture, debris created by the resulting containment environment (thermal and chemical) and CSS washdown should be considered in the analyses. Examples of this type of debris are disbonded coatings in the form of chips and particulates and chemical precipitants caused by chemical reactions in the pool.

Response: 2(d)(iii)
The primary constituents of the debris bed that results from the most limiting pipe break (i.e., the pipe break that results in the minimum accident-condition NPSH margins for the ECCS and CSS pumps) are reported below. The case involving the pressurizer spray line assumes 50% of the Min-K is removed.

Insulation Species	LBLOCA Crossover Leg	LBLOCA RV Nozzle	LBLOCA PZR Spray Line
Low-density fiberglass (NUKON, Transco)	190 ft^3	0 ft^3	0 ft^3
Reflective metal insulation (Mirror, Diamond)	0 ft^2	0 ft^2	0 ft^2
Qualified coatings (in ZOI)	209 lb	219 lb	0 lb
Unqualified epoxy coatings (outside ZOI)	55 lb of 21-mil chips	55 lb of 21-mil chips	55 lb of 21-mil chips
Unqualified coatings	203 lb of particulates	203 lb of particulates	203 lb of particulates
Microtherm	0 ft^3	24 ft^3	0 ft^3
Min-K	0 ft^3	0 ft^3	26.5 ft^3
Latent debris (fiber)	16 lb	23 lb	18 lb
Latent debris (particulate)	104 lb	131 lb	131 lb

Response: 2(d)(iii) (continued)

The maximum predicted head loss values for these cases, based on a conceptual design of a fully submerged screen of 2,000 square feet, are reported below.

LBLOCA Crossover Leg	LBLOCA RV Nozzle	LBLOCA PZR Spray Line
0.06 ft of water	2.61 ft of water	2.50 ft of water

The maximum predicted head loss reported above for the RV Nozzle and PZR Spray Line breaks is based on best available information. Per section 3.7.2.3.1.1 of the NRC SE methodology, currently available microporous insulation head loss data is suitable as a scoping tool only. To address this limitation, head loss testing of the plant-specific debris types and mixtures to validate analysis assumptions and to validate and/or adjust the NUREG/CR-6224 head loss correlation is underway and scheduled to be completed by March 31, 2006.

The thin-bed effect was considered. For a 2,000 square foot screen, 20.8 cubic feet of fibrous debris is required to establish an uncompressed fiber bed of 1/8 of an inch thickness on the screen. The maximum predicted head loss is 1.04 ft of water.

As demonstrated by Integrated Chemical Effects Testing (ICET), post-accident chemical effects can potentially increase the head loss across the sump screen. However, ICET does not quantify the potential impact. Industry indicated during the 07-20-05 ACRS meeting that testing to quantify the head loss increase due to chemical effects will be performed with an expected completion date of March 2006. To determine if the results of ICET and follow-on head loss testing are applicable to HNP, plant-specific material types and quantities and ranges of sump pool pH have been compared to those of the ICET. Summary results from this comparison for materials of interest are presented at the end of the response to request 2(d)(iii) (Table titled, "Plant-Specific Comparison to ICET"). The percentage of submergence for the various materials is expected to be similar to that used in the testing. Although HNP has a higher allowable pH than was tested, the much lower surface-to-volume and volume-to-volume ratios for HNP, compared to the as-tested values, demonstrates that potential chemical effects at HNP are likely bounded by ICET results.

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Response: 2(d)(iii) (continued)

While evaluation of chemical effects testing is ongoing, a set of debris bed head loss adjustment factors based upon preliminary observations has been prepared by the NEI Sump Performance Task Force. These adjustment factors were presented in the NEI GL 2004-02 September 1, 2005 response template for the first four ICETs. These factors are based upon judgment and preliminary test results. Further examination of ICET results and follow-on head loss testing will be needed to provide the necessary confirmation of these factors and could result in an adjustment increase or decrease. The crossover leg break is best represented by ICET #1. For ICET #1, the NEI response template recommends a maximum debris bed head loss increase of 90%. If the debris bed head loss reported above, for a fibrous thin bed, is increased by 90%, the result is 1.98 ft H_2O (1.9 * 1.04 ft H_2O). The head loss margin after accounting for chemical effects is equal to the clean screen margin minus the debris bed head loss with chemical effects, or 3.0 ft H_2O - 1.98 ft H_2O = 1.02 ft H_2O. This remaining margin is judged adequate to account for reasonable increases in the assumed head loss adjustment factor for the crossover leg break.

The pipe breaks involving Microtherm and Min-K do not directly correlate to one of the ICET tests. However, there is margin, between the maximum predicted head losses and the NPSH margin, to account for chemical effects. As stated in the response to request 2(b), because of the relatively thin debris-bed thickness and the low screen approach velocity for these cases, testing is expected to demonstrate that existing head loss assumptions are conservative and that an even greater margin is available to accommodate chemical effects. The final design for the HNP replacement sump screens will include an appropriate margin for chemical effects associated with microporous debris.

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Response: 2(d)(iii) (continued)

Plant-Specific Comparison to ICET

Material	Ratio Tested[4] (ratio units)	Test Percent Submerged[4]	Plant-Specific Ratio (ratio units)
Zinc in Galvanized Steel	8.0 (ft^2/ft^3)	5	4.34 (ft^2/ft^3)
Inorganic Zinc Primer Coatings (non-top coated)	4.6 (ft^2/ft^3)[1]	4	0.72 (ft^2/ft^3)
Inorganic Zinc Primer Coatings (top coated)	0.0 (ft^2/ft^3)[2]	0	0 (ft^2/ft^3)
Aluminum	3.5 (ft^2/ft^3)	5	0.019 (ft^2/ft^3)
Insulation material[3] (fiberglass or calcium silicate)	0.137 (ft^3/ft^3)	75	0.0176 (ft^3/ft^3)

Buffer	Tested pH[4]	Plant-Specific pH
Sodium hydroxide	10	7-11
Trisodium Phosphate	7	N/A

1. This value addresses both untopcoated zinc-rich primer applied as an untopcoated system as well as zinc-rich primer exposed as a result of delamination of topcoat.
2. Topcoated inorganic zinc coatings are protected against exposure to both containment spray and the liquid inventory of the containment pool by the topcoat. Therefore, they do not contribute to the development of corrosion products. Also, epoxy-based protective coatings provide for small quantities of leachable material, typically less than 200 ppm of the applied coating. Therefore, epoxy topcoats are judged to not contribute to the corrosion product mix post-accident and are not included in this test program.
3. Two tests are to be conducted using 100% fiberglass as the insulation material. Two additional tests are to be conducted with 80% calcium silicate and 20% fiberglass as the insulation material. In both cases, the same ratio of insulation material-to-sump liquid inventory will be used.
4. Tested ratios, tested percent submerged, and test pH are from Tables 1, 3 and 4, respectively, of "Test Plan: Characterization of Chemical and Corrosion Effects Potentially Occurring inside a PWR Containment Following a LOCA," Revision 13 dated July 20, 2005.

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Request: 2(d)(iv)
The basis for concluding that the water inventory required to ensure adequate ECCS or CSS recirculation would not be held up or diverted by debris blockage at choke-points in containment recirculation sump return flowpaths.

Response: 2(d)(iv)
The existing containment water level calculation does not contain the level of detail to address GSI-191. A new calculation has been drafted to address specific concerns identified by GSI-191 pertaining to water level. For example, containment layout and drainage drawings were reviewed to identify locations where water could be held up. These hold-up volumes (e.g., containment building elevator, steam generator and Reactor Coolant Pump (RCP) pedestals, manipulator crane rails, RCP oil collection system, holdup on the operating floor, and miscellaneous holdup) were subtracted from the total containment water inventory when determining the minimum sump pool level at start of recirculation. Additionally, this calculation considers several conservatisms that the original calculation does not (e.g., volume of water to fill containment spray piping, volume of water to fill pressurizer steam space, water in transit from the break and from containment spray, water vapor in the containment atmosphere, condensation on surfaces, and the thermal contraction of the RCS fluid as it cools down). Potential barriers to recirculation sump return flowpaths within containment were identified through containment walkdowns and review of containment layout and drainage drawings. These barriers, and the bases for why they will not impact the minimum credited containment water level at the start of recirculation, are described below:

1. Openings at bottom of personnel shield (bioshield) wall. Each of the twenty openings is 18 inches by 18 inches; the twenty openings are spaced over the circumference of the bioshield wall. It is unlikely that all of these openings would be blocked by debris subsequently restricting the flow of water from inside the bioshield wall to outside the bioshield wall.

2. Personnel access passageways in the bioshield wall. Basis: each of the three passageways is separated from the others and has a wire mesh door. The bottom of the door is approximately 10 inches above the floor. The configuration of these doors assures that water can pass through them, even with debris on them.

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Response: 2(d)(iv) (continued)

3. Fuel transfer canal drain. Basis: The drain pipe is 10 inches in diameter, and the drain valve located at the terminus of the drain line is administratively controlled in the locked open position when the unit is at power. The entrance of this drain line will be covered with a trash rack (see Response 2(b)) to prevent it from being clogged by large pieces of debris.

Request: 2(d)(v)
The basis for concluding that inadequate core or containment cooling would not result due to debris blockage at flow restrictions in the ECCS and CSS flowpaths downstream of the sump screen, (e.g., a HPSI throttle valve, pump bearings and seals, fuel assembly inlet debris screen, or containment spray nozzles). The discussion should consider the adequacy of the sump screen's mesh spacing and state the basis for concluding that adverse gaps or breaches are not present on the screen surface.

Response: 2(d)(v)
The HNP Downstream Effects Evaluations could not be completed until the supporting industry topical report (WCAP-16406) was made available. The WCAP was issued to the industry on June 30, 2005, which allowed insufficient time to complete the evaluations in time to support this GL response. The schedule for when downstream effects evaluations will be completed and when corrective actions will be identified is reported in Response 2(b). Results from downstream component evaluations that have been drafted to date are described below:

1. The HNP evaluation of downstream effects is in progress. The minimum opening size currently identified is 0.209 of an inch as stated in response 2(b), which is larger than the conceptual sump screen opening size of 1/8 of an inch (0.125") diameter.

2. The replacement sump screens will be designed, fabricated and installed to eliminate any adverse gaps or breaches to the extent practicable. These activities will ensure that no gaps, which may exist, are larger than the minimum sump screen opening size.

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Request: 2(d)(vi)
Verification that close-tolerance subcomponents in pumps, valves and other ECCS and CSS components are not susceptible to plugging or excessive wear due to extended post-accident operation with debris-laden fluids.

Response: 2(d)(vi)
The HNP Downstream Effects Evaluations could not be completed until the supporting industry topical report (WCAP-16406) was made available. The WCAP was issued to the industry on June 30, 2005, which did not allow sufficient time to complete the evaluations supporting this GL response. Preliminary evaluation of downstream components with respect to wear has identified some components that are potentially susceptible to wear. The schedule for when downstream-effects evaluations will be completed and when corrective actions will be identified is reported in Response 2(b).

Request: 2(d)(vii)
Verification that the strength of the trash racks is adequate to protect the debris screens from missiles and other large debris. The submittal should also provide verification that the trash racks and sump screens are capable of withstanding the loads imposed by expanding jets, missiles, the accumulation of debris, and pressure differentials caused by post-LOCA blockage under predicted flow conditions.

Response: 2(d)(vii)
The design of the replacement sump screens at HNP is not complete. The final design will ensure that trash racks will be capable of protecting the associated debris screens and that the trash racks and sump screens will be capable of withstanding the applicable design basis loads identified in Request 2(d)(vii).

Request: 2(d)(viii)
If an active approach (e.g., backflushing, powered screens) is selected in lieu of or in addition to a passive approach to mitigate the effects of the debris blockage, describe the approach and associated analyses.

Response: 2(d)(viii)
The conceptual replacement sump screen design for HNP is entirely passive.

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Request: 2(e)
A general description of and planned schedule for any <u>changes to the plant licensing bases</u> resulting from any analysis or plant modifications made to ensure compliance with the regulatory requirements listed in the Applicable Regulatory Requirements section of this generic letter. Any licensing actions or exemption requests needed to support changes to the plant licensing basis should be included.

Response: 2(e)
A general description of the changes to the plant licensing bases that will be necessary as a result of implementing GSI-191 corrective actions is provided below. The 10CFR50.59 evaluation of GSI-191 corrective actions will be performed subsequent to completion of related design activities. For the purpose of responding to this GL, a preliminary review of currently-identified design changes using the guidance in 10CFR50.59 was performed to determine if a license amendment (i.e., prior NRC approval) will be required to support any of the identified licensing bases changes. The results of this preliminary review identified that no license amendment changes will be required.

At this time, the only licensing basis change identified is to include in the FSAR a description of the deterministic evaluation methodology (i.e., the NRC methodology) used to evaluate post-accident recirculation capability (as described in Response 2(c)). The FSAR currently discusses satisfying the intent of Regulatory Guide 1.82 Revision 0 and also specifically discusses satisfying the 50% screen blockage assumption by scale-model testing. HNP exceptions to the NRC methodology are identified in the response to Request 2(c) above. The first exception is consistent with section 3.4.2.1 of Volume 2 of the NRC methodology, which allows the use of testing to establish a coating ZOI different from that recommended in the methodology. The second exception is consistent with section 3.7.2 of the CR3 pilot plant audit report.

Progress Energy's procedure for performing 10CFR50.59 screens and evaluations states that "(a) departure from a method of evaluation described in the FSAR used in establishing the design bases or in the safety analyses means (1) changing any of the elements of the method described in the FSAR unless the results of the analysis are conservative or essentially the same; or (2) changing from a method described in the FSAR to another method unless that method has been approved by NRC for the intended application." The changes to the plant design and licensing bases to address GSI-191 involve replacing the methodology contained in Regulatory Guide 1.82, Revision 0, (i.e., an assumption of 50% sump screen blockage) with a detailed, deterministic methodology. This detailed, deterministic methodology has been

Response: 2(e) (continued)

approved by the NRC for the intended application, and because neither of the HNP exceptions constitute a substantive deviation from the NRC methodology, a license amendment is not required.

Request: 2(f)
A description of the existing or planned programmatic controls that will ensure that potential sources of debris introduced into containment (e.g., insulations, signs, coatings, and foreign materials) will be assessed for potential adverse effects on the ECCS and CSS recirculation functions. Addressees may reference their responses to GL 98-04, to the extent that their responses address these specific foreign material control issues.

Response: 2(f)
Existing and planned programmatic controls are described below.

1. Insulation inside containment. HNP has two specifications for insulation. The specification for blanket-type thermal insulation requires the insulation media, woven fiberglass fabric, threading, scrim, and hook-and-loop fasteners to meet all the requirements of USNRC Reg. Guide 1.36. This blanket-type thermal insulation must meet the requirements of Reg. Guide 1.82, Revision 1. Horizontal longitudinal metal jacketing seams are to be lapped downward; vertical longitudinal seams are to be staggered at least 45 degrees. The current design and licensing basis allows replacement of metallic reflective insulation on a one-for-one basis with fiberglass blanket insulation. HNP plans to revise the design and licensing basis to preclude replacement of metallic reflective insulation on a one-for-one basis with fiberglass blanket insulation.

2. Coatings. The existing Coatings Program requires inspections each refueling outage to monitor the condition of Service Level 1 coatings inside containment. Degraded coatings are required to be documented and then dispositioned by the coating engineer or program manager. Degraded qualified coatings that are not remediated are added to the unqualified coatings log. The maximum allowable quantity of unqualified coatings has now been established in GSI-191 analyses. Plant documents will be developed to incorporate this limit. An unqualified coatings log is maintained to ensure that this unqualified coatings limit will not be exceeded.

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Response: 2(f) (continued)

3. Tagging. Existing equipment tagging procedures specify use of tagging materials that will not readily transport and potentially impact sump recirculation. For example, equipment tags used in containment are required to be stainless steel or porcelain-coated stainless steel which is not expected to transport under maximum sump pool velocities. The attaching device for stainless-steel tags should be stainless-steel braided wire. Non-stainless steel components inside containment are stenciled when possible to eliminate the possibility of labels plugging strainers and drains or entering suction piping. The placement of deficiency tags on equipment in containment is specifically not required due to the possibility of loose tags clogging the recirculation sumps. HNP plans to revise the deficiency tag procedure to provide additional guidance regarding deficiency tags in containment.

4. FME. The plant procedure for at-power containment entries controls the quantity of material that may block the recirculation sump screens taken into containment and the quantity of aluminum and zinc taken into containment. As part of the HNP response to NRC Bulletin 2003-01, this procedure was revised to provide more specific guidance on containment cleanliness and to implement the plant's more stringent criteria for containment cleanliness. The containment closeout inspection procedure specifically looks to ensure: no loose debris that could be transported to the sumps; that the wire mesh doors on the 221' elevation are closed and latched (this measure is expected to capture some debris inside the bioshield wall, although no credit is taken for debris retention); no obstructions that could block flow through the scuppers in the bioshield wall; no debris at the bottom of the elevator shaft; and that scaffolding is either approved to remain in containment, is removed from containment, or inventoried for aluminum and zinc content. As part of the HNP response to NRC Bulletin 2003-01, this procedure was revised to provide more specific guidance on containment cleanliness and to implement the plant's more stringent criteria for containment cleanliness. The containment closeout procedure will be revised again following completion of modifications described in Response 2(b) to ensure that the refueling canal drain trash rack is installed at the completion of each refueling outage.

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Response: 2(f) (continued)

5. Sump strainer integrity. The containment recirculation sump inspection procedure is performed on each sump every refueling outage. The recirculation sumps are considered FME Areas. The procedure checks for evidence of structural distress, abnormal corrosion, adverse gaps or breaches, and validates that the suctions for the RHR and Containment Spray pumps are not restricted by debris. As part of the HNP response to NRC Bulletin 2003-01, this procedure was revised to specifically check for gaps or breaches in the recirculation sump screens and supporting structures that could allow debris larger than that which could pass through the sump screens, to bypass the sump screens. No changes to the current inspection guidance are anticipated as a result of replacing the recirculation sump screens.

6. Modifications. The modification procedure has two screening questions that steer the engineer to determine the potential impacts to plant programs, engineering disciplines, and plant customers for modifications that could affect post-LOCA debris in containment. Specifically, the questions are "Create or alter the potential sources of debris which could interfere with ECCS suction or reactor building sump pumps?" and "Result in addition or reduction of zinc, galvanized steel, or aluminum in containment?" See also item 1 in this list for proposed controls on insulation changes.

7. Fire and radiant barriers. The fire protection program manual requires that for modifications to fire barriers that are not one-for-one replacements or equivalent to requirements, a Fire Protection Engineer must provide input and/or requirements and review for compliance with applicable NFPA codes, insurance requirements, regulatory commitments and industry guidelines, recommendations, and good practices. Additionally, the screening questions in the modification procedure discussed above are applicable to such modifications.

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REGULATORY COMMITMENTS

Regulatory Commitments

The actions committed to by Carolina Power & Light Company doing business as Progress Energy Carolinas, Inc. (PEC) in this document are identified below. Any other actions discussed in this submittal represent intended or planned actions by PEC. They are described for the NRC's information and are not regulatory commitments.

Regulatory Commitment(s)	Scheduled Completion Date
1. Complete the corrective actions of this response letter (HNP-05-101) to Generic Letter (GL) 2004-02 by the GL requested due date of December 31, 2007.	December 31, 2007